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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/701,183
Filing Date: November 04, 2003
Appellant(s): AKKERMAN ET AL.

Jay M. Brown
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 7/29/07 appealing from the Office action mailed 3/1/07.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,403,397 Katz 6-2002

Klauk et al "high-mobility Polymer Gate Dielectric Pentacene Thin Film Transistors" Journal of Applied Physics, vol. 92, No. 9 (Nov. 1, 2002), pp. 52595263.

Mushrush et al. "Easily Processable Phenylene-Thiophene-Based Organic Field-Effect Transisotros and Solution-Fabricated Nonvolatile Transistor Memory Elements", Journal American Chemical Society, Vol. 125, No. 31 (2003), pp. 9414-9423.

Katz et al. "Synthesis, solubility, and field-effect mobility of elongated and Oxa-Subsititued Dialkyl Thiophene Oligomers extension of "polar intermediate" synthetic strategy and solution deposition on transistor substrates", chem. mater. vol. 10, pp. 633-638 (American chemical society 1998).

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 7-8, 10-11, 13, 19, 22-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Katz (U.S. Patent No. 6,403,397).

Referring to figures 1-2, Katz teaches an integrated circuit, comprising:

a dielectric layer (14) comprising a surface, a portion of said surface having exposed aromatic groups (polyimide is aromatic polymer, see col. 3, lines 15-19), the dielectric layer being formed form a precursor composition including a member selected from the group consisting of:

Naphthalenes, styrenes, phenols, benzenes, and cresol. With regard to the term "dielectric layer being formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresol" is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not. It is also noted that polyimide is formed from organic precursor".

a polycrystalline semiconductor layer (16) comprising an organic semiconductor composition overlying and in contact with the portion of said surface, the organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety. With regard to the term "a polycrystalline semiconductor layer comprising an organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety" is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not;

a gate electrode (12);

a source electrode (18); and

a drain electrode (20);

the source and drain electrodes being in spaced apart conductive contact with a channel portion of the semiconductor layer, the gate electrode being positioned to control a conductivity of the channel portion (see figures 1-2).

Regarding to claim 2, each of said moieties comprises on average at least about three conjugated aromatic rings (see col. 4, lines 1-23).

Regarding to claim 3, the alkyl chains comprise on average between about 3 and about 12 carbon atoms (see col. 4, lines 1-23).

Regarding to claim 8, in which each of said moieties comprises on average between about three and about six conjugated aromatic rings (see col. 4, lines 1-23).

Regarding to claim 10, the channel portion has an on/off ratio of at least about 100 (see table, col. 7-8).

Regarding to claim 11, the semiconductor composition comprises a member selected from the group consisting of: 5,5'-Bis(4-n-hexylphenyl)-2,2'- bithiophene; 5,5"-Bis(4-a-hexylphenyl)-2,2":5',2"-terthiophene; 5,5'"-Bis(4-n-hexylphenyl)- 2,2':5',2":5" ,2'"-quaterthiophene; 1,4-Bis[5-(4-n-hexylphenyl)-2-thienyl)benzene; 2,5-Bis[4(4'-hexylphenyl)phenyl]thiophene; 5,5'"-Bis(4-n-hexyl)-2,2":5', 2':5",2'"-quaterthiophene; 5,5""-Bis(4-n-hexyl)-2,2':5', 2"-5" 2'":5'",2""-pentathiophene; 1,4-Bis((5-n-hexyl)-2,2'-bithienyl]benzene; 2,6-bis(5-hexylthien-2-yl)naphthalene; and mixtures (see col. 4, lines 1-23).

Regard to claim 12, the term "dielectric layer comprises poly(4-vinylphenol-co-2-hydroxyehtyl methacrylate)" is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by process

claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

Regarding to claim 19, polycrystalline semiconductor layer comprising an organic semiconductor composition, overlying and in contact with a portion of a surface having exposed aromatic groups (vaporizing (annealing) would form the polycrystalline film, see col. 5, lines 45-49).

Regarding to claim 22, an alkyl chain comprises, as a linkage in the chain, a member selected from the group consisting of oxygen, nitrogen or sulfur (see col. 4, lines 1-23).

Regarding to claim 23, an alkyl chain comprises a hetero substituent (see col. 4, lines 1-23).

Regarding to claim 24, a thiophene or phenyl group includes an alkyl- or hetero-substituent (see col. 4, lines 1-23).

Regarding to claim 25, each of the moieties comprises between about 3 and about 10 conjugated aromatic rings (see col. 4, lines 1-23).

Regard to claims 1-3, 8, 11, 19, 21-24, these claims contains method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 5-6, 12-13, 21, 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katz (U.S. Patent No. 6,403,397) as applied to claims 1-3, 7-8, 10-11, 19, 22-24 above in view of Klauk et al., High-mobility polymer gate dielectric pentacene thin-film transistors, Journal of applied physics, November 1, 2002, pages 5259-5263,Vol. 92, Number 9 (cited by appellant), and Mushrush et al., Easily processable Phenylene-Thiophene-based organic field-effect transistors and solution-fabricated nonvolatile transistor memory elements, J. Am. Chem. Soc., 2003 pages 9414-9423, Vol. 125, Number 31 (cited by appellant.

Referring to figures 1-2, Katz teaches an integrated circuit, comprising:
a dielectric layer (14) comprising a surface, a portion of said surface having exposed aromatic groups (polyimide is aromatic polymer, see col. 3, lines 15-19), the dielectric layer being formed form a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresol. With regard to the term "dielectric layer being formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresol" is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how

actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not. It is also noted that polyimide is formed from organic precursor".

a polycrystalline semiconductor layer (16) comprising an organic semiconductor composition overlying and in contact with the portion of said surface, the organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety. With regard to the term "a polycrystalline semiconductor layer comprising an organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety" is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not;

a gate electrode (12);

a source electrode (18); and

a drain electrode (20);

the source and drain electrodes being in spaced apart conductive contact with a channel portion of the semiconductor layer, the gate electrode being positioned to control a conductivity of the channel portion (see figures 1-2, meeting claim 29).

However, the reference does not teach dielectric layer is formed from a precursor composition of the group consisting of polyphenol, a polystyrene, a poly(phenoxyethyl methacrylate), poly(4-vinylphenol-co-2-hydroxyethyl methacrylate), the semiconductor composition comprises 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene and the specific crystal size, and mobility of the semiconductor layer.

Klauk et al. teaches a forming an organic thin-film transistor, wherein forming a dielectric layer by using poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) (see page 5259). It is obvious that the same material would form a layer with a refractive index of at least about 1.52.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a dielectric layer is formed from a precursor composition of the group consisting of naphthalenes, styrenes, phenols, and cresols of poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) which has a refractive index of at least about 1.52 in process of Katz as taught by Klauk et al. because the process would form a device with large carrier mobility, low threshold voltage, low subthreshold swing, and large on/off current ratio (see page 5262).

Mushrush et al teach forming an organic field effect transistors wherein forming an organic semiconductor layer by using 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene (see abstract, page 9414 and 9416).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form an organic semiconductor layer by using 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene in process of Katz as taught by Mushrush et al. because

the material would provide a transistor with high carrier mobility, low leakage current, straightforward synthesis, facile film deposition, and chemical stability.

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the crystal size, and mobility of the semiconductor layer, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.- semiconductor crystal size of at least about 0.1 micrometer, polycrystalline semiconductor layer has a mobility of at least about 0.1 centimeters squared per volt-second), discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

The specification contains no disclosure of either the critical nature of the claimed arrangement (i.e.- semiconductor crystal size of at least about 0.1 micrometer, polycrystalline semiconductor layer has a mobility of at least about 0.1 centimeters squared per volt-second) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the appellant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (FED. Cir. 1990).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would forming the semiconductor layer with semiconductor crystal size of at least about 0.1 micrometer and a mobility of at least about 0.1 centimeters squared per volt-second in process of Katz in order to optimize the process.

Claims 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katz (U.S. Patent No. 6,403,397) as applied to claims 1-3, 7-8, 10-13, 19, 21-24, 28-30 above in view of Katz et al., Synthesis, Solubility, and Field-Effect Mobility of Elongated and Oxa-Substituted a, w-Dialkyl Thiophene Oligomers, Extension of "Polar Intermediate" Synthetic Strategy and Solution Deposition on Transistor Substrates, Chem. Mater., 1998, Page(s) 633-638, Volume 10, number 2 (cited by appellant).

Katz teaches forming a dielectric layer and forming a polycrystalline semiconductor on the dielectric layer. However, the reference does not teach dielectric layer has at least the polarizability of chlorobezene.

Katz et al. teaches dielectric layer has at least the polarizability of chlorobezene (see page 637).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form dielectric layer has at least the polarizability of chlorobezene in process of Katz as taught by Katz et al. because the material would provide a transistor with high carrier mobility, and chemical stability.

(10) Response to Argument

A- Appellant contends that claims 1-3, 7-8, 10-11, 13, 19, and 22-24 are not anticipated by Katz:

a- Appellant contends that the composition ingredients "a dielectric layer comprising a surface, a portion of the surface having exposed aromatic group", and "a polycrystalline

semiconductor layer comprising an organic semiconductor composition overlying and in contact with the portion of the surface, the organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety" are structural claim limitation of claims 1 and 19. Katz clearly teaches at col. 3, lines 15-17, dielectric layer 14 or 34 is a polymeric material such as polyimides or polymethacrylates. And, polymeric material such as polyimides or polymethacrylates is well known as aromatic material because polymer contains thousands of carbon rings (see any dictionary). Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains aromatic carbon rings. Katz also teaches at col. 30-43 and Table, surface treating polyimides or polymethacrylates or silicon oxide 14 or 34 to change the affinity, solubility or miscibility of the surface of an **aromatic ring attached surface** (see col. 4, lines 40-43). Appellant also admits page 12, line 1 of the brief that polyimides can be aromatic. Hence, Katz clearly teaches at col. 4, lines 31-46, col. 6, line 26-49 and Table, claims 1-16 and summary of invention that dielectric layer 14 or 34 comprising a surface, a portion of said surface having exposed **aromatic** group of polyimides or polymethacrylates as claimed. Katz also clearly teaches in col. 3, lines 66-67, col. 4, lines 1-17, an organic semiconductor composition 16 or 36 comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety.

Katz discloses at col. 4, lines 31-46:

10) Surface Treatment

(11) Regions of greater affinity are generally created by providing a surface with **moieties** that interact favorably with the organic semiconductor

material to be deposited thereon (or its solvent in the case of a solution). Regions of lower affinity are generally created by providing a surface with **moieties** that are less compatible with moieties on the organic semiconductor material (or its solvent in the case of a solution). For example, the attachment of a **fluorocarbon chain** to a species will tend to decrease the solubility or miscibility of that species with another species to which an **aromatic ring** is attached. Similarly, the attachment of a **hydrocarbon chain** to a species will tend to decrease that species' solubility or miscibility with another species to which an OH group is attached, thereby suggesting a decreased compatibility.

Katz discloses at col. 3, line 66 to col. 4, line 23:

Possible **organic semiconductor materials** are reflected in the examples below, and include materials based on the naphthalene-1,4,5,8-tetracarboxylic diimide (NTCDI) framework, naphthalene-1,4,5,8-tetracarboxylic dianhydride (NTCDA), copper phthalocyanine, perfluorinated copper phthalocyanine, regioregular poly (3-hexyl**thiophene**) (RR-PHT), 2,5-linked **thiophene** tetramers, pentamers, and hexamers (also known as alpha-4T, alpha-5T, and alpha-6T compounds)--either unsubstituted or substituted at the terminal 5 positions with **linear alkyl** or alkoxyalkyl **chains** of about 4 to about 12 atoms in length, co-**oligomers** of 2,5-linked **thiophene** rings and 1,4-linked benzene rings about 5 rings long--either unsubstituted or substituted as described for the **thiophene** oligomers (e.g., 1,4-bis(5-(5-hexylthien-2-yl)thien-2-yl)benzene (DHT4Ph)), 11,11,12,12-tetracyanonaphtho-2,6-quinodimethane, pentacene, naphthacene, and anthradithiophene (ADT) and terminal **dialkyl** derivatives thereof (e.g., dihexylanthradithiophene--DHADT). (The DHT4Ph used in the examples was synthesized according to procedures described for hexylated 5- and 6-ring compounds in W. Li et al, Chem. Mater., Vol. 11, page 458 (1999), using 1,4-diiodobenzene as the source of the benzene ring.) Other materials are also possible in accordance with the guidelines presented herein.

b- Appellant contends that the precursor compositions for the dielectric layer "dielectric layer being formed from a precursor composition including a member selected from the group consisting of: naphthalenes, styrenes, phenols, benzenes, and cresol are structural limitations of claims 1 and 19. This is not found persuasive because Katz discloses at col. 3, lines 15-17,

dielectric layer can be formed from polymeric material such as polyimides or polymethacrylates. And, polyimides or polymethacrylates is inherently formed from precursor containing benzenes, or phenols or naphthalenes or styrenes or cresols in the art. Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains aromatic carbon rings of benzenes, or phenols or naphthalenes or styrenes or cresols. And, the method of producing a product does not add any structure to the structure limitation. Since, Katz teaches at col. 4, lines 40-43, **aromatic** surface of dielectric layer such as polymeric material of polyimides or polymethacrylates. Hence, The limitations "dielectric layer comprising a aromatic surface of polyimides or polymethacrylates **formed from** a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols" is a process limitation.

c- Appellant contends that there are two reasons for the recitations constitute structural limitations of claims 1 and 19:

a1- these recitations expressly define a dielectric layer having exposed aromatic group selected from naphthalenes, styrenes, phenols, benzenes, and cresols. This is not found persuasive because **Katz** discloses at col. 3, lines 15-17, **dielectric layer can be formed from polymeric material such as polyimides or polymethacrylates**. And, polyimides or polymethacrylates is inherently formed from precursor containing benzenes, or phenols or naphthalenes or styrenes or cresols in the art. Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains **aromatic** carbon rings of benzenes, or phenols or naphthalenes or styrenes or cresols. And, the method of producing a product does not add any structure to the structure limitation. Since, Katz teaches at col. 4, lines 40-43, aromatic surface

of dielectric layer such as polymeric material of polyimides or polymethacrylates. Hence, The limitations "dielectric layer comprising an aromatic surface of polyimides or polymethacrylates formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols" is a process limitation.

Appellant contends that Katz fails to disclose or suggest a surface having exposed aromatic groups. This is not found persuasive because Katz clearly teaches at col. 3, lines 15-17, dielectric layer 14 or 34 is a polymeric material such as polyimides or polymethacrylates. And, polymeric material such as polyimides or polymethacrylates is well known as **aromatic** material because polymer contains thousands of carbon rings (see any dictionary). Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains **aromatic** carbon rings. Katz also teaches at col. 30-43 and Table, surface treating polyimides or polymethacrylates or silicon oxide 14 or 34 to change the affinity, solubility or miscibility of the surface of an **aromatic ring attached surface** (see col. 4, lines 40-43). Appellant also admits page 12, line 1 of the brief that polyimides can be **aromatic**. Note: page number is shown at the bottom of each page of the Brief. Hence, Katz clearly teaches at col. 4, lines 31-46, col. 6, line 26-49 and Table, claims 1-16 and summary of invention that dielectric layer 14 or 34 comprising a surface, a portion of said surface having exposed aromatic group of polyimides or polymethacrylates as claimed. Katz also clearly teaches in col. 3, lines 66-67, col. 4, lines 1-17, an organic semiconductor composition 16 or 36 comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety.

Appellant contends that Katz fails to disclose or suggest a dielectric layer formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols. This is not found persuasive because **Katz** discloses at col. 3, lines 15-17, **dielectric layer can be formed from polymeric material such as polyimides or polymethacrylates**. And, polyimides or polymethacrylates is inherently formed from precursor containing benzenes, or phenols or naphthalenes or styrenes or cresols in the art. Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains aromatic carbon rings of benzenes, or phenols or naphthalenes or styrenes or cresols. And, the method of producing a product does not add any structure to the structure limitation. Since, Katz teaches at col. 4, lines 40-43, aromatic surface of dielectric layer such as polymeric material of polyimides or polymethacrylates. Hence, The limitations "dielectric layer comprising a aromatic surface of polyimides or polymethacrylates formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols" is a process limitation.

From above, Katz clearly teaches forming a dielectric film of polyimides or polymethacrylates and the surface having exposed aromatic group. And, polyimides or polymethacrylates inherently contains benzenes, or phenols or naphthalenes or styrenes or cresols or inherently formed from precursor of benzenes, or phenols or naphthalenes or styrenes or cresols. Hence, the rejection of claims 1-3, 7-8, 10-11, 13, 19, and 22-24 under 35 U.S.C 102(b) as anticipated by Katz clearly meets the burden under 35 U.S.C. 102(b).

B- Rejection of claims 5-6, 12-13, 21, and 28-30 under 35 U.S.C 103(a) over Katz in view of Klauk and Mushrush

a- Appellant contends the recited dielectric layer composition are structure limitation of claim 28. Examiner concurs with Appellant that Katz's dielectric of polyimides or polymethacrylates is a structure limitation because polyimides or polymethacrylates inherently contains benzenes, or phenols or naphthalenes or styrenes or cresols or inherently formed from precursor of benzenes, or phenols or naphthalenes or styrenes or cresols. Katz teaches poly**methacrylates** but does not teach dielectric layer of poly**methacrylates** is similar to **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**). However, Klauk et al. teaches forming a dielectric layer by using **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**) (see page 5259). Therefore, Katz's poly**methacrylates** in view of Klauk's **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**) clearly meets the claimed limitation as claimed in claim 28.

Appellant contends that Katz fails to disclose or suggest a semiconductor device including a dielectric layer "surface having exposed aromatic groups". This is not found persuasive because Katz clearly teaches at col. 3, lines 15-17, dielectric layer 14 or 34 is a polymeric material such as polyimides or polymethacrylates. And, polymeric material such as polyimides or polymethacrylates is well known as **aromatic** material because polymer contains thousands of carbon rings (see any dictionary). Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains **aromatic** carbon rings. Katz also teaches at col. 30-43 and Table, surface treating polyimides or polymethacrylates or silicon oxide 14 or 34 to change the affinity, solubility or miscibility of the surface of an **aromatic ring attached surface**

(see col. 4, lines 40-43). Appellant also admits page 12, line 1 of the brief that polyimides can be **aromatic**. Hence, Katz clearly teaches at col. 4, lines 31-46, col. 6, line 26-49 and Table, claims 1-16 and summary of invention that dielectric layer 14 or 34 comprising a surface, a portion of said surface having exposed **aromatic** group of polyimides or polymethacrylates as claimed. Katz also clearly teaches in col. 3, lines 66-67, col. 4, lines 1-17, an organic semiconductor composition 16 or 36 comprising a conjugated thiophene or phenyl group and comprising alkyl **chains** at ends of the chain-like moiety.

b- Appellant contends the legal standard for combining references

Appellant contends that KSR international v. Teleflex, US Supreme Court, April 30, 2007..... However, Katz teaches all the limitation as claimed in claim 28 having dielectric layer of poly**methacrylates** but does not teach dielectric layer of poly**methacrylates** is similar to **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**). However, Klauk et al. teaches forming a dielectric layer by using **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**) (see page 5259). Since, Katz's poly**methacrylates** is similar/identical to Klauk's **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**). Hence, it is clearly that combination of Katz in view of Klauk meets the criteria as set forth in KSR international v. Teleflex, US Supreme Court, April 30, 2007.

Katz clearly teaches at col. 3, lines 15-17, dielectric layer 14 or 34 is a polymeric material such as polyimides or polymethacrylates. And, polymeric material such as polyimides or polymethacrylates is well known as aromatic material because polymer contains thousands of carbon rings (see any dictionary). Katz teaches at cols. 7-8 of Table, the chemical surface

structure of polyimides that contains **aromatic** carbon rings. Katz also teaches at col. 30-43 and Table, surface treating polyimides or polymethacrylates or silicon oxide 14 or 34 to change the affinity, solubility or miscibility of the surface of an **aromatic ring attached surface** (see col. 4, lines 40-43). Appellant also admits page 12, line 1 of the brief that polyimides can be aromatic. Hence, Katz clearly teaches at col. 4, lines 31-46, col. 6, line 26-49 and Table, claims 1-16 and summary of invention that dielectric layer 14 or 34 comprising a surface, a portion of said surface having exposed **aromatic** group of polyimides or polymethacrylates as claimed. Katz also clearly teaches in col. 3, lines 66-67, col. 4, lines 1-17, an organic semiconductor composition 16 or 36 comprising a conjugated thiophene or phenyl group and comprising alkyl **chains** at ends of the chain-like moiety. And, polyimides or polymethacrylates is inherently formed from precursor containing benzenes, or phenols or naphthalenes or styrenes or cresols in the art. Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains aromatic carbon rings of benzenes, or phenols or naphthalenes or styrenes or cresols. And, the method of producing a product does not add any structure to the structure limitation. Since, Katz teaches at col. 4, lines 40-43, **aromatic** surface of dielectric layer such as polymeric material of polyimides or polymethacrylates. Hence, The limitations "dielectric layer comprising an aromatic surface of polyimides or polymethacrylates formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols" is a process limitation.

Therefore, Katz in view of Klauk and Mushrush clearly teaches all the limitations as claimed in claim 28.

c- Appellant contends the proposed combination of Katz, Klauk and Mushrush is unjustified, and fails to disclose or suggest appellants' devices recited in claim 28.

a1- Appellant contends that Klauk disclosed a pentance organic thin film transistor including poly-4-vinylphenol-co-2-hydroxyethylmethacrylate as a gate wherein the compound does not contend alkyl chains used in the semiconductor composition. This is not found to persuasive because Katz (primary reference) clearly teaches in col. 4, lines 1-17, an organic semiconductor composition comprising a conjugated thiophene or phenyl group and comprising alkyl **chains** at ends of the chain-like moiety.

a2- Appellant contends that the proposed combination including Katz and Klauk fails to teach the use of aromatic dielectric layers including a composition selected from polyphenols, polystyrenes, poly(4-vinylphenol-co-2-hydroxyethyl methacrylate), and poly(phenoxyethy methacrylates). This is not found persuasive because Katz clearly teaches at col. 3, lines 15-17, dielectric layer 14 or 34 is a polymeric material such as polyimides or polymethacrylates. And, polymeric material such as polyimides or poly**methacrylates** is well known as **aromatic** material because polymer contains thousands of carbon rings (see any dictionary). Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains **aromatic** carbon rings. Katz also teaches at col. 30-43 and Table, surface treating polyimides or poly**methacrylates** or silicon oxide 14 or 34 to change the affinity, solubility or miscibility of the surface of an **aromatic ring attached surface** (see col. 4, lines 40-43). Appellant also admits page 12, line 1 of the brief that polyimides can be aromatic. Hence, Katz clearly teaches at col. 4, lines 31-46, col. 6, line 26-49 and Table, claims 1-16 and summary of invention that dielectric layer 14 or 34 comprising a surface, a portion of said surface having exposed **aromatic**

group of polyimides or polymethacrylates as claimed. Katz also clearly teaches in col. 3, lines 66-67, col. 4, lines 1-17, an organic semiconductor composition 16 or 36 comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the **chain-like** moiety. And, Klauk teaches forming a dielectric film by using **poly**(4-vinylphenol-co-2-hydroxyethyl **methacrylate**) (see page 5259).

a3- Appellant contends that Klauk disclosed a pentance organic thin film transistor including poly-4-vinylphenol-co-2-hydroxyethylmethacrylate as a gate wherein the compound does not contend alkyl chains used in the semiconductor composition. This is not found to persuasive because Katz (primary reference) clearly teaches in col. 4, lines 1-17, an organic semiconductor composition comprising a conjugated thiophene or phenyl group and comprising **alkyl chains** at ends of the chain-like moiety. While relies on Mushrush et al. to teach forming an organic field effect transistors wherein forming an organic semiconductor layer by using 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene (see abstract, page 9414 and 9416). However, the reference does not clearly point out the mobility of the organic semiconductor layer, but one of ordinary skill in the art would able to recognize that the same material would provide the same chemical as well physical properties, such as carrier mobility. It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the crystal size, and mobility of the semiconductor layer, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.- semiconductor crystal size of at least about 0.1 micrometer, polycrystalline semiconductor layer has a mobility of at least about 0.1 centimeters squared per volt-second), discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

The specification contains no disclosure of either the critical nature of the claimed arrangement (i.e.- semiconductor crystal size of at least about 0.1 micrometer, polycrystalline semiconductor layer has a mobility of at least about 0.1 centimeters squared per volt-second) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the appellant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (FED. Cir. 1990).

d- Regarding to claims 5, 6, 12-13, 21 and 30, Appellant contends the combinations of Katz, Klauk and Mushrush do not teach a dielectric layer comprising a surface, a portion of the surface having exposed aromatic groups, the dielectric layer including polyphenols, polystyrenes, poly(4-vinylphenol-co-2-hydroxyethyl methacrylate), and poly(phenoxyethy methacrylates). This is not found persuasive because Katz clearly teaches at col. 3, lines 15-17, dielectric layer 14 or 34 is a polymeric material such as polyimides or polymethacrylates. And, polymeric material such as polyimides or polymethacrylates is well known as **aromatic** material because polymer contains thousands of carbon rings (see any dictionary). Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains **aromatic** carbon rings. Katz also teaches at col. 30-43 and Table, surface treating polyimides or polymethacrylates or silicon oxide 14 or 34 to change the affinity, solubility or miscibility of the surface of an **aromatic ring attached surface** (see col. 4, lines 40-43). Appellant also admits page 12, line 1 of the brief that polyimides can be **aromatic**. Hence, Katz clearly teaches at col. 4, lines 31-46, col. 6, line 26-49 and Table, claims 1-16 and summary of invention that dielectric layer 14 or 34 comprising a surface, a portion of said surface having exposed aromatic group of polyimides or polymethacrylates as claimed. And, polyimides or polymethacrylates is inherently formed from

precursor containing benzenes, or phenols or naphthalenes or styrenes or cresols in the art. Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains aromatic carbon rings of benzenes, or phenols or naphthalenes or styrenes or cresols. And, the method of producing a product does not add any structure to the structure limitation. Since, Katz teaches at col. 4, lines 40-43, aromatic surface of dielectric layer such as polymeric material of polyimides or polymethacrylates. Hence, The limitations "dielectric layer comprising a aromatic surface of polyimides or polymethacrylates formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols" is a process limitation. Katz also clearly teaches in col. 3, lines 66-67, col. 4, lines 1-17, an organic semiconductor composition 16 or 36 comprising a conjugated thiophene or phenyl group and comprising **alkyl chains** at ends of the chain-like moiety. And, Klauk teaches forming a dielectric film by using poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) (see page 5259).

-C- regarding to claim 26, appellant contends Katz in view of Katz article fail to disclose a semiconductor device including: a dielectric layer surface having exposed aromatic groups; or aromatic groups selected from Naphthalene, styrenes, phenols, benzene, and cresol. This is not found persuasive because **Katz** discloses at col. 3, lines 15-17, **dielectric layer can be formed from polymeric material such as polyimides or polymethacrylates**. And, polyimides or polymethacrylates is inherently formed from precursor containing benzenes, or phenols or naphthalenes or styrenes or cresols in the art. Katz teaches at cols. 7-8 of Table, the chemical surface structure of polyimides that contains **aromatic** carbon rings of benzenes, or phenols or naphthalenes or styrenes or cresols. And, the method of producing a product does not add any structure to the structure limitation. Since, Katz teaches at col. 4, lines 40-43, **aromatic** surface

of dielectric layer such as polymeric material of polyimides or polymethacrylates. Hence, The limitations "dielectric layer comprising an aromatic surface of polyimides or polymethacrylates formed from a precursor composition including a member selected from the group consisting of: Naphthalenes, styrenes, phenols, benzenes, and cresols" is a process limitation. And, Klauk teaches forming a dielectric film by using poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) (see page 5259).

From the above Katz in view of Klauk and Mushrush clearly teaches the forming the dielectric film comprising a surface, a portion of the surface having exposed **aromatic** groups, the dielectric layer including polyphenols, polystyrenes, poly(4-vinylphenol-co-2-hydroxyethyl methacrylate), and poly(phenoxyethyl methacrylates), organic semiconductor composition comprising a conjugated thiophene or phenyl group and comprising **alkyl chains** at ends of the **chain-like** moiety. Hence, the rejection of claims 1-3, 5-8, 10-13, 19, 21-24, 26, 28-30 meet the burden under 35 U.S.C. 103 (a) to establish prima facie case of obviousness.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Thanh Nguyen

TN

Conferees:

Carl Whitehead, Jr. (SPE)

David Blum